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ON THE RETURNS OF PRODUCTIVE AGENTS
AND ON THE PRODUCTIVITY OF CAPITAL
IN PARTICULAR.

SUMMARY.

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I.

ON THE RETURNS OF PRODUCTIVE AGENTS IN GENERAL.

IN the masterly study which he has published on the question of diminishing returns, Professor Carver has maintained that the tendency toward diminishing returns

does not manifest itself, as was formerly believed, simply with relation to productive agents combined in varying proportions with a fixed quantity of land, but that this tendency is something universal.¹ Take any productive agent or group of productive agents. If with this agent, or group of agents, which we suppose fixed, we combine successively increasing quantities of that other agent or those other agents which must be added to it to obtain such and such sort of goods as one wishes to have, then, according to Carver, the product will, to be sure, increase more quickly at first than the productive agent or agents which have been varied; but a time will come when the increase of the product will be less rapid than that of our agent or agents, when the returns of the latter, in other words, will relatively diminish.

I consider Carver's thesis true, and, moreover, I consider that it constitutes one of the most important truths of economic science. At the same time, Carver, in expounding his ideas on the problem of diminishing returns, has expressed a view which I regard as inexact, at least partially. My intention here is to point out this error which I think I see in Carver's work, and at the same time to contribute towards clearing up the question, till now so hazy, of the productivity of capital.

Carver illustrates the "law" of diminishing returns with the following formulæ:—

If x acres of land with y units of capital and labor give p product, x acres of land with ay units of capital and labor will give a product superior to p , but inferior to ap .

If y units of capital and labor with x acres of land give p product, y units of capital and labor with ax acres of land will give a product *superior* to p , but inferior to ap .

¹ See Carver, *The Distribution of Wealth* (1904), chap. 3.

When, the quantity of land remaining the same, says he, the quantity of labor and capital is increased, the product *does not increase* as much as the labor and capital. If the quantity of labor and capital does not change and the quantity of land is increased, the product will not increase as much as the land.¹

If I understand Carver's thought, one productive agent remaining constant and the others increasing, the product, from the moment when the tendency to diminishing returns begins to act, will increase less quickly than these productive agents. It will increase less and less quickly, but *it will continue incessantly to increase*.

Carver, on the point which I wish to discuss, has, in short, only universalized the conception which many theorists had expressed before him, with regard to agricultural returns. Read, for example, Marshall. "The application of increased capital and labour to land," writes that author, "*adds* a less than proportionate amount to the produce raised."²

To be sure, other economists had had a somewhat different conception. Their opinion was that, by the application, to a given area of land, of increasing quantities of capital and labor, one must arrive, after a certain time, at a maximum product, and that afterwards production must necessarily remain stationary. Among the authors who have treated of population, certain ones have shown that they imagined a "fulness of cultivation," an extreme limit for the production of the means of subsistence. Such is the case of Wallace.³ Turgot writes: "The earth has a limited fertility, and supposing it ploughed, manured, marled, ditched, irrigated, weeded as much as it can be,

¹ Pages 67-68. The italics are mine.

² Principles of Economics, 5th ed., p. 153 (IV., 3, § 1) It is I who italicize the word "adds."

³ See his Dissertation on the Numbers of Mankind in Ancient and Modern Times (1753), *passim*.

it is evident that all further expense would be useless;¹ . . . there is then a maximum of production which it is impossible to go beyond, and when it has been reached, advances produce absolutely nothing.”² Assuming a specially technical point of view, Liebig taught that, beyond a certain measure, all supplementary ploughing and manuring was powerless to increase the production of plants.³ Quite recently an author who, like Carver, proclaims the universality of the tendency to diminishing returns, Valenti, said, in a quite general manner, that the increase of any one agent in a combination of productive agents, after a certain point, adds nothing to the product.⁴

To say that the quantity of the product, when one productive agent remains invariable and the quantity of the others increases, augments indefinitely, but less and less, and to say that it increases to a certain maximum to remain stationary afterwards, amounts to about the same thing. What I wish to establish is that both propositions, in so far as they are general propositions, are false.

Grant that

(1) x units of a group of productive agents with y units of another group give p product,

it can then be granted that

(2) ax units of the first group with ay units of the second group give ap product.

Perhaps, indeed, it will be said that the process from

¹ Turgot adds here, “Such increase might even be harmful.” One might be tempted to see in these words an anticipation of the conception which I am going to state presently. I do not think, however, that they have that meaning.

² Observations sur un mémoire de M. de Saint-Péravy (Œuvres de Turgot, éd. Daire, 1, p. 420).

³ According to Esslen, Das Gesetz des abnehmenden Bodenertrages seit J. von Liebig, Munich, 1905, pp. 8–9.

⁴ Principii di scienza economica (Florence, 2d ed., 1909), § 62, p. 167. The way in which Valenti formulates his proposition is not very happy, as may be seen by consulting his book.

formula (1) to formula (2) is not legitimate. When an enterprise is enlarged by the proportionate multiplication of all the productive agents which are employed in it, the product may be found to be increased more or less than the productive agents in question. But to this observation I shall reply by assuming that the process from my first formula to my second formula does not necessarily express the process from a relatively small enterprise to a larger enterprise. There is no reason why the second formula should not relate to enterprises like that—or those—to which the first related, but a times as numerous.¹ And under this hypothesis, I may add, it will surely be true.²

We know on the other hand that the return of a productive agent or group of agents, when these agents increase in proportion to the others, may increase at first. We can thus have:—

(3) x units of one group of productive agents with ay units of another group give $a'p$ product, which is larger than ap .

Let us compare formulæ (3) and (2). This comparison will show us that, if with a fixed quantity— ay —of a certain group of productive agents we combine increasing quantities of other agents,—1 at first and a afterwards,—we may see a decrease not only in the relative return of these agents, but *in the absolute product*.

¹ Carver expresses at first the “law of economies of large production,” saying (p. 66) that if, for example, x acres of land with y units of capital and labor give P product, ax acres of land with ay units of capital and labor will give either more than aP or less than aP . These formulæ relate to simple enterprises, but nothing in them shows it

² After having expressed the “law of economies of large production,” as we have seen in the preceding note, Carver, coming back to this law, says (pp 90–91) that, when an enterprise is enlarged, the relation changes between a certain factor of the production, the management, which remains fixed, and the *ensemble* of the other factors. In that way, he thinks, he can reduce the law of economies of large production to that of the variation of returns. It seems to me it would be necessary to make some reservations upon this reduction,—this is not the place to state them,—but it certainly contains some truth.

Thus this proposition, very different from that of Carver on the same question, is drawn from the very fact of increasing returns,—a fact acknowledged by Carver. There is, moreover, in the latter's book a passage in which the truth which I am trying to establish appears clearly enough. Carver somewhere¹ considers a production which would employ land and labor. If the land is gratuitous, he says, it will be advantageous to extend the labor over as much land as is necessary in order that this labor may give the maximum product. And, if we consult the table to which Carver refers us,² we can see that by extending the same labor over a larger quantity of land we shall have less product. The table in question shows us that, if we apply labor over 10 acres of land, it is for an outlay of 20 days' labor that the return from the labor will be the greatest. If we lay out 20 days' labor, each day will produce 19 bushels of grain, whereas with 10 days' labor, or with 40, the number of bushels produced per day will be only 15. Suppose, then, that we have at our disposal 20 days' labor. If we lay it out on 10 acres, we shall obtain 20×19 bushels, or 380. Or shall we lay it out on 20 acres? 10 days laid out on 10 acres give 10×15 , or 150 bushels. 20 days laid out on 20 acres will give twice as much, or 300 bushels. And thus it is better, having at our disposal 20 days, to lay them out on 10 acres than on 20.

I think I have established that the increase of one factor or group of factors of production, the other factors remaining constant, might result in a diminution of product. Let us now look to experience for examples.

Here is a field of a certain area. If we apply to it indefinitely increasing quantities of labor, what will the product become? One may say that it will increase indefinitely. It can even be always increased, it would

¹Page 71. See also pp. 72-73.

²Page 58.

seem, by more minute care given to the plants; only, after a certain time, this increase will become extremely slow. In any case the product will never be found to diminish.¹

It is the above case, it will be noted, which almost exclusively occupied the authors who, before Carver, have speculated on diminishing returns. We must not, then, be surprised if Carver, universalizing the views of these authors, has been led to think that the increase of one productive agent, the others remaining constant, could not diminish the product. But let us imagine that we lay out our fixed quantity of labor on greater and greater tracts of land, that we make 10 men, for example, cultivate 5 hectares in grain, then 10 hectares, then 100, then 1,000, then 10,000. The product which they will be able to obtain—if, in proportion as the land to be cultivated becomes vaster, they force themselves to spread their labor over all the land that is given them—will diminish after a certain time. It will even finally become nil.

Another example. An individual devotes all his activity to the directing of an enterprise. Let us suppose that the enterprise enlarges indefinitely. After a certain time the increasing difficulty which our individual will experience both in organizing and in overseeing the conduct of his business may, and doubtless must, have as a consequence not only a diminution in the productivity of the different agents employed, but a diminution in the absolute product.²

To have done with my general remarks, I shall offer an observation apropos of the demonstration that Carver gives us of the universality of the law of diminishing returns.³ Let us suppose, says Carver, that this law is

¹ It might, however, be remarked that a time will come when there will no longer be room in our field for a greater number of men.

² I am considering here productivity and product from the point of view which certain authors call technical. I do not take into consideration that diminution in the value of products which may result from the necessity of going to seek more distant markets and from the descendant form of the curve of demand. The consideration of this additional datum of the question would corroborate my assertion.

³ Pages 67–68.

verified for certain productive agents, in so far as they are combined with others which remain fixed. It will then be true with relation to these latter, inasmuch as they are made to vary and as the former remain stable. Let us state, for example, these two formulæ:—

(1) x units of a certain productive agent with y units of another agent give P product;

(2) x units of the first agent with ay units of the second give more than P .

On the other hand, one can write:—

(3) ax units of the first agent with ay units of the second give aP product.

Now the comparison of formulæ (2) and (3) shows that, given a certain quantity of units of the second agent,—or ay ,—if the number of units of the first is raised from 1 to a , the product increases in a less proportion. In other words, that certain increases of the first agent are accompanied by a decrease of the returns which it gives.

Carver here neglects the case, which might occur, where we should have:—

(4) x units of the first agent with ay units of the second give less than P .

If we compare formulæ (3) and (4), we shall see that certain increases of the first productive agent, the second remaining constant, are accompanied by increasing returns of the former.³

³ The demonstration which I have just pointed out is the inverse of the one above by which, starting from the fact of increasing returns, I proved that certain increases of productive agents might be accompanied by an absolute diminution of the product.

One more remark. If we combine two productive agents, M and N , it is only for relatively large quantities of N that the increase of N will be found to bring about the diminution of the product. It follows that it is only for relatively small quantities of M that the returns of this factor will be found to increase with its augmentation. And the converse is also true.

II.

ON THE PRODUCTIVITY OF CAPITAL.

1. *Definition and Measure of Capital.*

I wish to examine now how the product varies when the relation of capital to the other productive agents changes. But, before proceeding to this examination, it is indispensable to determine carefully what capital is as a distinct productive agent, how it must be defined and measured if we wish to be able to speak of a relation between capital and the other productive agents.

Let us cast a glance at the writings of the economists who have treated of diminishing returns. It is a fact worthy of remark that these authors, at least in the passages relative to the variations of returns, do not explain what they mean by the word "capital." Turgot, in the passage which I have quoted,¹ speaks of the relation of the product to the "avances"; and by this word he designates the capital and labor applied to land without making between these two things any distinction. West, in his *Essay on the Application of Capital to Land*,² announces to us³ that he is going to study, as the title of his work indicates, the variations which are produced in the returns of capital when one applies more and more capital to the land. But immediately⁴ he begins to speak to us not of the returns of capital, but of the returns of labor. He asserts that labor, in agriculture, gives diminishing returns.⁵ Malthus, when he deals with agricultural returns, considers sometimes capital applied to land, sometimes capital and labor.⁶ Ricardo speaks here of capital or of labor, or of capital and labor, in an

¹ *Œuvres*, éd. Daire, i. pp. 418-422 ² 1815 ³ Page 2

⁴ As early as p. 3. ⁵ Pages 6 and 7.

⁶ *The Nature and Progress of Rent* (1815), pp. 17, 29, 36, 41, *Principles of Political Economy* (1st ed., 1820), pp. 153-197.

apparently indifferent manner.¹ Similarly, Stuart Mill.² Marshall takes care most frequently to speak of the doses of capital and labor applied to the land,³ but he sometimes lets fall one of these terms.⁴

Among the more recent authors, Bullock,⁵ Carver, Valenti, always distinguish capital and labor; but, in what they have written on diminishing returns, no very precise indication is to be found about the way in which they distinguish these two notions.

I mean by no means to maintain that the economists whom I have reviewed have all failed to form a clear conception of capital. For several of them such an assertion would be entirely false. But there are some among the authors I have quoted of whom this is quite the case. And I shall say more: among those who have had a clear conception of capital it seems that certain ones had a vague feeling that their conception of capital was not the one which permits us to assign capital its place in the theory of diminishing returns, and, in a broader way, in the theory of production. At least, one is tempted thus to interpret the hesitation, the indecision, which is manifest in the formulæ which they use.

What, then, is capital, after all, for these authors who have busied themselves especially with the productivity of capital, with the rôle of capital in production? Ordinarily, the authors in question make capital consist of those goods which are employed in production and which have been produced. Capital consists, to use the ex-

¹ Principles, chap. 2. See, for example, the end of paragraph in Gonner's edition (1891).

² Principles, notably IV., chap. 3.

³ Principles, I., chap. 12, paragraphs 1-2.

⁴ See, for example, p. 155, n. 2 (IV., chap. 3, paragraph 21).

⁵ The Variation of Productive Forces (*Quarterly Journal of Economics*, August, 1902).

pression of Böhm-Bawerk, of intermediary products.¹ And thus those economists who recognize only labor as the original factor of production, or who at least, in their speculations on production, are inclined to pay particular attention to labor, and to assign it a preponderant place, will say that capital is past labor collaborating with present labor. A cultivator, for example, expends labor to plough his land; but, in order to plough, he needs a plough. This plough, which has been constructed a longer or shorter period before, is capital; it represents past labor, the help of which renders more efficacious the labor at present being expended by our ploughman.

Such is the conception of capital most frequent among the theorists of production. With regard to this conception it seemed to me necessary to make one remark at the very start. If one is to employ, in the theory of production, the concept of intermediary product, it is important that one should understand this concept in the broadest manner. Suppose some men are breaking land in order to permit it to produce harvests: this improvement of the land which will result from the breaking will have to be regarded as an intermediary product. It is this which the labor of our men produces immediately—if one may be permitted the expression—and will contribute afterwards to the production of harvests. In capitalistic production, Böhm-Bawerk teaches us, man does not create in a direct manner the property which he desires. He resorts to detours. Very well. But what must be noted is that these detours do not always consist in creating, in the strictest sense of the word, “goods” from which the former will come, I mean in producing isolable goods.

How can the intermediary products be measured? Our authors measure them by what they have cost to

¹ In German, *Zwischenprodukte*

obtain. Thus, wishing to estimate the capital (that is to say, the intermediary product) which a laborer employs, they will consider often the labor which is incorporated in this intermediary property; they will estimate that past labor which collaborates with present labor.¹

But, then, how can the relation be established of capital to the other productive agents? Here several solutions may be imagined. Let us examine them in order.

1. Suppose a cultivator who cultivates his field for a year. Let us say that for his cultivation he employs land, labor, and capital; and by this last word let us understand, for example, the machines, the instruments which our cultivator has acquired for his exploitation. If our cultivator pays 10,000 francs for the rent of his field, if he expends 20,000 francs for manual labor and 20,000 for the machines, instruments, etc., we may say that the expense in capital is to the other expenses as one to two. As one may see, we are considering here one group of productive operations neglecting the operations which have preceded these and which technically form a part of the same productive process. Let us suppose that our cultivator before undertaking his cultivation has himself manufactured the machines and the instruments which he will have to use. Then, with the manner of reckoning which I have indicated, the capital will disappear. In such conditions it is apparent that this manner of reckoning implies a contradiction; for to concentrate attention to a certain stage of a productive process is to invite us—the very use which is made here of the expression “intermediary products” shows it plainly enough—to go back further than this stage.

¹ See, for example, Thunen, *Der isolirte Staat*, 2d part, 1st division, paragraphs 8–9; Bohm-Bawerk, *Positive Theorie des Capitaless*, II, 1, pp. 96–97, *Einige strittige Fragen der Capitalstheorie*, 1., 2, pp. 11–13 (Bohm-Bawerk does not reduce capital to past labor exclusively. He indicates very well that into the constitution of capital there enters still another element, the element of nature.)

2. If one wishes to speculate on capital, one must include a productive process which is complete from a technical point of view, or else limit one's self to a fragment of such a process which from the economic point of view will form a complete whole, as was the case with our cultivating enterprise above; but then, in order to define capital, one must not go beyond this fragment. Submitting, then, to this condition, one can measure the quantity of capital by the sum of the intermediary products which intervene, in one way or another, in the productive process; in other words, by the sum of the intermediary products which are created or bought from the beginning of the process until the acquisition of the fruits. But as one will observe that the acquisition of the fruit is always separated by an interval of time, however small it may be, from the productive operations which have prepared it, that there is not, strictly speaking, any productive act which gives its product instantaneously, and that thus every operation of production may, and must, be regarded as giving rise at the start to intermediary products, then one will be persuaded that, wishing to measure the capital as I have just indicated, we shall arrive at making it equal to the sum of the outlays of production or of the advances. The ratio of the capital to the other productive agents will be the same as if the capital were identified with the advances, and this relation will always be a ratio of one.¹

3. One may establish the ratio of capital to the other productive agents by classifying under the first rubric those intermediary products only which are employed in the very last stage of the productive process. For example, in a forest exploitation the capital will be measured by the amount of the expenses of planting, etc.; in short,

¹ I shall have occasion to come back to this subject; for I shall have to speak of the conception which identifies capital with the "advances."

of all the expenses which are anterior to the cutting. This conception is, it seems to me, the one which is suggested to us rather than the others when we are told that capital is past labor collaborating with present labor. It seems to me to challenge very serious criticism.

In the first place, is it possible to establish a demarcation between this last stage of the productive process which we must isolate and the others, or, again, to speak as certain authors do, between present labor and past labor? Shall we not be led, when we examine things carefully, to reduce the last stage of production, the present labor, to nothing? A workman, to finish the manufacture of an object, takes ten days, and in his labor, if he has the help of instruments, he employs materials which, altogether, have cost ten days' labor. Can one say that the manufacture of the object in question has required a capital of the value of ten days' labor? Why should not one consider as "present" labor only the labor of the last day, which would make the value of capital employed equal to nineteen days of labor? Why should not one confine one's self to only the work of the last hour, of the last second, of the last instant? It seems that this is what we should do. And in this way, once more, the measure of the intermediary products will be found to coincide with that of the productive advances.

Let us admit that it is legitimate not to reduce present labor to the labor of the last instant. Let us do like those authors who, isolating at the end of the productive process a stage of a certain duration, regard this last stage as being in no respect capitalistic. Then, with the manner of measuring capital which I have indicated, we shall arrive at strange results. Here is a production in which one thousand units of manual labor are expended ten years before the obtaining of the product. Here is another

production, in which one thousand units of manual labor are expended one month before the obtaining of the product, and in which it would take five units of manual labor to finish the product. The first production, under the conception of capital we are here considering, would not be more capitalistic than the second. This example suffices, I think, to show that a measure of capital like that which is occupying us departs from what is permitted by usage. And it will also be granted, I am sure,—what is still more important,—that it could not have any scientific utility.

I come now to that second conception of capital which makes capital consist in the advances which are made for production. Undertaking certain productive enterprises, I am compelled to advance a certain sum. This sum which I advance—and which I hope to recover, after a certain time, increased by a surplus—is, as is currently said, the capital which I place or invest in these operations which I am undertaking.¹

Capital, according to the new definition which we have decided upon, is property, seen from the point of view of its value,—property which might be consumed, which might be employed to procure an immediate or almost immediate satisfaction, and of which we make such a use that we shall recover it or have its product only after the expiration of more or less time. Let us see, then, since that is

¹ The definition of capital which is indicated here is the same one that I have adopted in my *Intérêt du capital* (see paragraphs 3-7) and in my *Manuel d'économie* (paragraph 86). It was a thorough study which I have recently made of the returns of productive agents which revealed to me the necessity of correcting it, or rather of completing it. (I shall note, in passing, that our second definition of capital, in so far as it is distinguished from the first, is scientifically very much superior to it. It makes capital something correlative to what may be called capitalization, and it also connects the notion of capital with that of interest. It invites us to examine why capitalization encounters obstacles, why capital obtains interest, etc.)

what interests us, what relations this definition establishes between capital and the other productive agents. Capital here is the productive advances. But in production—we have already seen—all outlays are advances. A landed proprietor putting his land under cultivation expends land. He also expends manual labor. Neither expense will give its product until later. Our land-owner, then, renounces for a time the value which he would get from his land, if, for example, he enjoyed it as a country seat; he renounces for a time the value of the manual labor which he employs; and doing this he employs capital. Capital, in short, is the expenses of production, whatever they may be, in so far as these expenses are not immediately, instantaneously productive. And thus, if you wish, capital is quite *essentially* distinct from the other productive agents, from land and labor. It is, again, if you like, that land and labor considered from a special point of view. But *quantitatively* it is not distinct from land and labor. It has no measure of its own. It will then be impossible to speak of variations of capital with relation to the other productive agents, to speak of returns, of a variable productivity of capital.

We are thus led to consider a third concept, which will be the preceding concept completed by a new element. This third concept is that of the expenses of production in so far as they constitute advances, *and as these advances are made for a certain period*. With this concept we are in the presence of a productive agent, if one may be permitted the expression, which not only is essentially distinct from the others, but which is also distinct from them quantitatively,—of a productive agent which has its own measure, and which in that way may and must be regarded as being added to the others. The obtaining of a certain

product, for example, will require an expense—in land and labor—of 10,000 francs. These 10,000 francs will have been advanced during an average period, say, of six months, or of a year, or of two years, and this average period of waiting for the product will be, in the production, something which will have to be taken into consideration.

How shall we designate the new concept which we have formed? Here we find ourselves confronted by a serious difficulty of vocabulary. Jevons proposes, when a pound is invested in a production for five years, that one speak of five pound-years, and, as a general expression, he employs that of “amount of investment of capital.” He wishes to have a distinction drawn between the amount of investment of capital and the amount of capital invested, the former being equal to the latter multiplied by the duration of the investment.¹ But I shall call attention to the fact that the correspondence of the two expressions does not convey the relation of the two concepts. And especially it seems to me necessary to express the first concept by a single word, seeing the prime importance which it has for economic science.

What word shall we choose? The usage of language, it cannot be denied, dissuades us from using the word “capital.” In current language, as Jevons has plainly felt, capital is advances considered from the point of view of their amount, and not at all from the point of view of the period for which they are made. On the other hand, however, economic theory assigns to capital a special rôle in production, and it is not possible to assign it this special rôle, we have seen, unless by the word “capital” we understand the expenses of production, inasmuch as they are made a determinate time before the obtaining of the product.

¹ Theory of Political Economy, chap. 7. (See Quantitative Notions concerning Capital.)

In presence of these two contrary reasons I admit that I feel greatly embarrassed. I am inclined, however, for the moment to give the word "capital" the sense which permits us to continue to see in capital a factor of production quantitatively distinct from the others. And thus in the following pages I shall employ this word to designate the concept which occupies us at this moment. The word "advances" designating the productive expenses in so far as they are not to give their product immediately, the word "capital" will designate the result of the multiplication of the amount of the advances by the duration of their investment.

Shall we illustrate by examples the definition of capital at which we have arrived? A cultivator employs a field during a certain year for a certain production. He expends upon it so many days of manual labor. If he expends nothing else, his capital will be the value of the use of the field, it will be the value of the days' labor in so far as these values are advanced for a certain period. It will be, if you wish, 10,000 francs in so far as they are advanced on the average for six months. In reality our cultivator employs, besides the land and the manual labor, instruments. Suppose, for the sake of simplicity, that these instruments are worn out in the year of cultivation which we are considering. These instruments will represent, with relation to him, along with the land and labor, a new factor of the production. And if they cost 3,000 francs, if they last eight months on the average, the capital of our cultivator will be increased by $3,000 \text{ francs} \times 8 \text{ months}$. Now, if we assume the social point of view, and wish to include the total of the productive operations which lead to the harvest, the instruments of which we have just spoken will cease to represent a distinct agent in production. They will be replaced by the land, by the labor which have enabled them to be created, and,

moreover, by capital, this capital corresponding to the value of the land and labor in question multiplied by the period for which it has been advanced.

I have just shown how capital should be measured. The measure which I have just indicated, however, is only one of the measures which may be adopted. There are two measures for capital, and there are two measures for the other factors of productions. The land, the labor, can be measured physically: thus one may speak of the use of so many hectares for so much time, of so many days of manual labor. And they can be measured from the point of view of value. Similarly for capital. When I measure capital by a certain value advanced during a certain time, that is, be it understood, a somewhat physical measure; for the value does enter into my measure, but it does not enter alone. To measure capital from the point of view of value is to express it in value, and in value alone; and, in order to do that, we must put, in place of the product of the multiplication of the value advanced by the period of the advance, a sacrifice which corresponds to that product, or, better, in an economy which admits of loans, the interest which corresponds to it. If, for example, the rate of interest is 5 per cent., then the expense in capital of any one who, in a production, had advanced 50,000 francs and waited for the product an average of two years, will be 5,000 francs, considering simple interest, and a certain sum larger than 5,000 francs, considering, as we certainly must do, interest compounded.

When one speculates on the productivity of agents, is it the technical measure or the measure in terms of value that should be adopted? In such speculations one compares certain productive agents, supposed to be fixed, with other agents which are made to vary. In the column of agents supposed to be fixed, one may adopt either one of the two measures indifferently. In the other col-

umn, if one has only one agent, one can likewise adopt whichever measure one prefers. But, if one has two or more agents, then it will be absolutely necessary to employ the measure in terms of value; for this measure is the only one which for all the productive agents, whatever they may be, reposes on one same principle. It is the only one which permits of totalizations; and, in the hypothesis which we are assuming, it is the variation of the sum of the productive agents of the second column the consequences of which we are investigating. If, for example, we take on the one hand the use of so much land, and on the other we consider the application of increasing quantities of labor and capital to this fixed quantity of land, we shall have in each case to find the sum of the labor and capital, and for that we shall have to measure the labor and capital from the point of view of their value.

When one wishes to study the productivity of capital, one will consider it with respect to the total of the other expenses of production, and one will suppose it varying, while the total in question remains fixed. Thus one can adopt for capital either of the two existing measures, and the other expenses of production will have to be measured in value.

We know now how, with that definition of capital which I have proposed, capital must be measured. By this measure we shall arrive at results quite different from those which one has if one defines capital as consisting of the intermediary products or of the advances of production. Suppose two forests planted at the same time with the same expense. One is cut at the end of ten years, the other at the end of twenty years. Suppose the expense of the cutting is the same in each case. Suppose besides, for the sake of simplicity, that between the transplanting and the cutting of the trees no expense intervenes,—that

we do not take into consideration, for example, the value of the use of the land during the time which the trees are allowed to grow. In that way, with my definition, the capital will be two times as great in one case as in the other. If, on the other hand, we identify capital with the advances, it will be the same in the two cases. If it is identified with the intermediary products to which the expenses of the last productive stage are applied, it will again be the same thing.

There are, however, cases where it may seem that the three conceptions of capital which I have carefully distinguished happen to coincide, where it seems that, knowing the advances or the intermediary products employed, we know *ipso facto* the capital,—such as I have defined it,—and inversely.

Suppose a manufacturer undertaking a certain production. He advances—I assume, for the sake of simplicity, that he does it all at once—50,000 francs. At the end of six months he obtains the product awaited; and at the same time he begins again an operation exactly similar to the first. This second operation, after six months, would be followed by a third, and so forth. At any moment which we select the advances of our manufacturer—I mean those advances which he has not yet recovered—amount to 50,000 francs, and the intermediary products which he employs, it is evident, amount to the same sum. Whatever period, on the other hand, we may consider, the capital employed by our manufacturer is equal to 50,000 francs multiplied by the period in question. We can then say simply that his advances amount to 50,000 francs, or that he is employing in his enterprise 50,000 francs' worth of intermediary products; and we can also say that he is employing a capital of 50,000 francs without specifying that this capital is employed for a determined period. If we know that the advances

in circulation of our manufacturer, or the intermediary products which he employs, are, at any moment, 50,000 francs, we shall know that in a given period he employs a capital equal to the product of 50,000 francs by the period in question, and inversely.

The remark which I just have made would hold good also for all those productions which may be called perpetual,—I mean for all those operations which do not cease with the obtaining of a certain product, but which are continued and renewed; at least, when these operations are regular, in the sense that the advances in course of use remain constant, and that the period of the advances is fixed. And one can also, without departing far from the truth, apply this remark to the economy of society; for in society, taking things as a whole, production offers, from the point of view both of the amount of the advances in course of use or of the intermediary products employed, as of the period of waiting for the products, that regularity of which I have just spoken.

It is important, however, to see clearly the meaning of the preceding remark. And first, it must be understood, this remark does not apply to a certain sort, or to certain sorts, of productive processes which would be—at least from the economic point of view—complete productive processes. What I have had in mind here is *sections* from perpetual productions or from complexes of production. Now, if one wishes to study the rôle of capital in production, it must be considered in economically complete productive processes.

But this is not all. In the hypotheses which I have indicated we know the amount of capital employed in a given period by the amount of advances in course of use, or of the intermediary products used *at a given moment* and inversely. We do not know the amount of the capi-

tal employed in a given period by the amount of the advances made or of the intermediary products used *in this same period*, nor inversely. Let us go back to the example above. Our manufacturer in one year used a capital equal to 50,000 francs \times 1 year. Here is another, however, who, advancing for the first time, like the former, 50,000 francs, does not recover them till the end of a year. In a year he, too, will have used a capital which is measured by 50,000 francs \times 1 year. At any moment he will have had, just like the other, 50,000 francs' worth of advances in circulation or of intermediary products. But in the year the advances will have been only 50,000 francs, whereas the other will have advanced twice 50,000 francs; and the same difference will exist as far as the intermediary products are concerned. Now, in order to speak of a correspondence between the three conceptions of capital which I have distinguished, it is absolutely necessary, since one of the three notions relates to a certain period of time, that the other two relate to this same period, and not to one instant.

Shall we show now that, if other authors have not defined capital as I have done, they have acknowledged sometimes in a more or less implicit manner, and have felt more or less obscurely, that this was the definition which imposed itself?

When Ricardo applies himself to demonstrating that the value of any good depends, not only on the labor which has been expended to produce it, but also on the time which elapses before it can be sold,¹ does he not invite us to conceive capital, in so far as it must be distinct from labor, in the manner which I have proposed?

Jevons identifies capital with what I have called advances. But we have seen that, beside the notion of

¹ Principles, chap. 1, § 4.

“capital,” he soon places that of “investment of capital.” And it is this second notion which at once, in his theory, becomes the more important. He will examine, for example, how the product varies, when, the expenses of production remaining the same, and consequently the “capital,” the period of waiting varies; that is to say, the “investment of capital.” He will tell us that, when the productive process is lengthened, the rate of interest is determined by the relation between the increase of the “investment of capital” on the one hand, and, on the other hand, the surplus of product obtained.¹

Böhm-Bawerk maintains that the relative quantity of capital employed in production is proportional to the period of production; and that permits him, when he wishes to trace a scheme of the productivity of capital, to substitute for the notion of capital—of that capital which he has defined as consisting of the intermediary products employed by the production—that of the period of the productive process. We shall see how he justifies this substitution. But it is permissible to suppose that he was led to make it partly by an intuition which he had of the manner in which capital must be defined in the theory of production.

Marshall understands by “capital” all the property, except land, which give a revenue.² That is quite a classic definition. He teaches us that capital is the result of labor, combined with abstinence or “waiting.” But he cannot help, after that, introducing the consideration of the period of this waiting. He will tell us, for example, that, when labor is replaced by capital, in reality it is labor accompanied by little waiting which is being replaced by labor accompanied by much waiting.³ And

¹ Theory of Political Economy, chap. 7 (General Expression for the Rate of Interest)

² Principles, II., 4, § 5.

³ VI, 1, paragraph 9, VI., 2, paragraph 9 (pp. 523, 540–541).

better still. In a certain passage¹ Marshall tells us what we must understand by those doses of labor and capital of which it is always a question in the theories on the diminishing returns of agriculture. To estimate these doses, it is necessary to add to the cost of the manual labor expended the interest on the advances.² What does that mean, except that capital, in so far as distinct from labor, is the very value of the labor considered at the same time in its amount and from the point of view of the period for which it is advanced?

We must not be surprised that these authors have not defined capital as I have felt bound to do. Nor must we be surprised that several of them have shown that they felt inclined to arrive at the definition which I have proposed. They have been prevented from adopting this definition by the usage of the several languages, which makes capital consist of property or of a value, and not of the product of the multiplication of the value by a period. But, on the other hand, as Marshall has well said, the word "capital," scientifically, has its most important use "in the inquiry how the three agents of production, land, labor, and capital, contribute to producing the national income, and how that income is distributed among the three agents."³ Now capital, we have seen, cannot figure in the theory of production as a really distinct agent unless it is defined as I have defined it. In the theory of distribution, on the other hand, the concept of capital is correlative to that of interest. Now it is sufficiently well known that interest is proportionate to what I would call capital; that is to say, to advances considered both in their amounts and in their period.

¹ IV., 3, paragraph 8 (p. 171).

² The interest of the capital employed, says Marshall; but, saying this, he is using the word "capital," in the same sentence, in two different senses

³ Principles, II, 4, paragraph 5 (p. 78).

2. Capital and the Period of the Productive Process.

What relation is there between capital and the duration of the productive process? I shall be very brief on this question, which is already settled, at least implicitly, in the preceding pages.

In a production an *absolute* increase of capital may be accompanied by an abridgment of the productive process. Take, for example, a cultivation for which 2,000 francs are spent one year before the harvest, 2,000 francs six months before the harvest, and 2,000 francs at the time of the harvest. Suppose that to these cultivating operations a new one were added, which takes place three months before the harvest, and which necessitates a supplementary expense of 2,000 francs. The quantity of capital will be found to be increased by 2,000 francs \times 3 months. And at the same time the average period of waiting will have diminished. It was originally six months since $\frac{2,000 \times 12 + 2,000 \times 6 + 2,000 \times 0}{6,000} = 6$. It will now

be only $5\frac{1}{4}$ months, since

$$\frac{2,000 \times 12 + 2,000 \times 6 + 2,000 \times 3 + 2,000 \times 0}{8,000} = 5.25.$$

But, if an absolute increase of the capital may be accompanied by a diminution of the period of the productive process, so a *relative* increase of capital will necessarily correspond to a lengthening of the productive process, and inversely. Likewise, a relative diminution of the capital and an abridgment of the productive process can never exist independently. In the case indicated above the productive process was abridged, and at the same time the relative importance of the capital was diminished, since the relation of the capital to the productive expenses

shifted from $\frac{2,000 \times 12 + 2,000 \times 6 + 2,000 \times 0}{6,000}$ to $\frac{2,000 \times 12 + 2,000 \times 6 + 2,000 \times 3 + 2,000 \times 0}{8,000}$; that is,

from 6 to 5.25.

It must be understood that, when I speak of relative capital, I consider capital, as I have already said we should do, in its relation with the totality of the other expenses of production, and with nothing else. Let us return to the same example. If we wish to make capital relative to the surface of land cultivated, then the absolute increase of the capital would also be a relative increase.

On the other hand, it will have been noticed that the numbers which indicate the relative size of the capital in the operations we are considering, are exactly the same as those which indicate the period of the productive processes. This signifies that the relative size of the capital is nothing else than the very period of the productive process. And, in fact, if we call a in a production the amount of the advances made, and call t the average time of waiting for the product, the capital will be equal to $a \times t$. And it is immediately evident that $\frac{a \times t}{t} = a$.

Then, if we call *capitalistic degree* of a production the *relative* size of the capital in this production,—and that is what the expression ought to signify,—this capitalistic degree will depend on the period of the productive process, since we have just seen that the relative size of the capital depends upon it.

Under the definitions of capital which depart from that which I have adopted, the correspondence is lost between the relative size of the capital, or the capitalistic degree of production, and the period of the latter. If we identify capital with the productive advances, then, whatever be the period of the productive process, the relative size of the capital will remain the same, or, better, there will be no relative size of the capital. If capital is identified with the intermediary products, then either it will be as stated above or else—supposing we measure the intermediary products in a certain way which we have seen—we shall

have different results, but results which will not assure the correspondence I have spoken of. Suppose a production in which 10,000 francs are expended a year in advance, and 10,000 immediately before the obtaining of the product. Suppose, on the other hand, another production in which 10,000 francs are expended six months in advance, and 10,000 immediately before the product is obtained. The period of the productive process is longer in the first production. And yet, the quantity of intermediary products would be the same in the first case as in the second, and the quantity of capital, so measured, would be the same.

Böhm-Bawerk, who makes capital consist in the intermediary products, has himself asserted, however, that a production is all the more capitalistic, in other words, that the proportion of capital employed in it is all the greater, when the waiting for the product, that is, the average interval between the expenses of production and the obtaining of the product, is longer.¹ This proposition appears evident to Böhm-Bawerk. It is for him "of axiomatic clearness."² Nevertheless, he takes the trouble to justify it.³ A people, he says, has at its disposal, in a given space of time, a certain quantity of "original productive forces."⁴ Since capital, then, consists of "past labor" and of productive forces of nature which have been, so to speak, stored up, then the longer the average duration of the productive processes, the greater the quantity of capital which collaborates, in each period, with the original productive forces of that period. If

¹ *Positive Theorie*, p. 94; see also the *Positive Theory of Capital and its Critics* (*Quarterly Journal of Economics*, vol. x pp. 121-133) and *Einige strittige Fragen der Capitalstheorie*, I, 2

² *Einige Fragen*, p. 11.

³ See *Positive Theorie*, pp. 96, ff.; *Einige Fragen*, pp. 11-13; see also the article in the *Quarterly Journal of Economics* already quoted.

⁴ *Originäre Produktivkräfte*. they are *Arbeitsleistungen* and *Bodensleistungen*. (*Positive Theorie*, pp. 96-97).

from a given port there starts, for a certain destination, one boat an hour, the length of the voyage will determine the number of boats on the way at any moment.¹

It must be carefully observed how Böhm-Bawerk reasons. He considers a cross-section of a perpetual and regular production, and this capital—that is, these intermediary products—which he measures, is the intermediary products employed at a given moment. In this way his reasoning is just. We have seen the fact that in a regular production the quantity of the intermediary products employed at a given moment corresponds to the capital—in the sense which I have given that word—employed in any period which one may care to consider. If, then, the relation of the capital employed in a period to the productive expenses of the same period gives us the average duration of the production, the relation of the intermediary products employed at a given moment with the productive expenses of a period will also give us that duration. But if we leave the special hypothesis which Böhm-Bawerk has assumed, if we cease to measure the intermediary products at a given moment, his thesis on the relation between the capitalistic degree of production to the duration of the production, *in the manner in which he defines capital*, will cease to be just.

Böhm-Bawerk, in short, defines capital without letting the notion of duration enter into his definition, after which he tries to establish a certain relation between the notion of capital employed in production and that of the duration of production. But this undertaking is vain. The relation in question will not be verified—at least in a universal manner—unless one has introduced the notion of duration into the very definition of capital.

¹ One may find something analogous to what Böhm-Bawerk says—*analogous, but not identical*—in Marx. See *Le Capital*, liv. II, chap. 15.

3. *The Productivity of Capital.*

We come at last, after long preparation, to the question which I purposed to treat. This question, it must be remembered, is that of the variations which take place, in the product obtained for each unit of expense,¹ when the relative size of the capital varies. It is that, in other words, of the manner in which the product varies, when the duration of the productive process is lengthened.

Böhm-Bawerk is the first who fixed his attention² on this question. Let us see, then, how he solves it.

In Böhm-Bawerk's opinion, when in production one uses roundabout methods, which do not give immediately the product that one wishes to have, one has, if these methods are well chosen, more products for each unit of expense.³ And the longer one consents to await the product, the more product one will have per unit of expense. With the lengthening of the productive process, if one chooses the productive methods well, the product per unit of expense will increase indefinitely, altho it must increase less and less quickly.⁴ If a month of

¹ I leave out of consideration, in the estimate of expenses, that expense which is represented by the use of capital as such.

² We already find, however, a hint in Jevons. "Every new machine, or other great invention," writes Jevons (*Theory of Political Economy*, chap. 7, General Expression for the Rate of Interest, 1st ed., p. 238), "will usually require the fixation of capital for a certain average time, and may be capable of paying interest upon it; but, when this average time is reached, it fails to afford a return for more prolonged investments." This hint of Jevons, which he gives incidentally, does not agree, as will be seen, with what Böhm-Bawerk teaches.

Jevons also writes, in the same passage (pp. 236-237): "Let the time [the time elapsing between the expenditure of labor and the enjoyment of the result] be t , and the produce for the same amount of labor t , which may be supposed always to increase with t . . ." But here Jevons is examining a certain problem, and the "always," which contradicts the thought of the passage quoted above, seems to represent only an editorial error.

³ *Positive Theorie*, pp. 18, 86 (I., ii., II. 1); *Einige Fragen*, p. 3 (i., 1).

⁴ *Positive Theorie*, I., i. (pp. 89-93, 97), III., iii. (p. 274); *Einige Fragen* i., 2 (p. 9), 8 (pp. 39-40); cf. the article already quoted in the *Quarterly Journal of Economics*.

labor, for example, gives at once 100 units product, with productive processes necessitating awaiting of one, two, three, four, five, six, seven years, we shall have respectively 200, 280, 350, 400, 440, 475, 500 units.¹ If it were decided to adopt productive processes of a duration of eighteen centuries, we should obtain products "high as mountains."²

This view of Böhm-Bawerk's has been criticised. But more than once it has been criticised without being well understood.³ I intend to mention here only the observations of those authors who have grasped Böhm-Bawerk's thought.

Bortkiewicz declares that for reasons of a physical order the lengthening of the productive process must have a limit. He seems, however, to hesitate about the point whether the series 100, 200, 280, 350, 400, 440, 470, 500, should be followed by zeros, or if it should be continued by repeating the number 500.⁴

Bleicher affirms that, lengthening the productive process, the product will not increase indefinitely, that there is a point where this product obtains its maximum, and after which it will diminish.⁵ And such is also the opinion of Fisher. The latter begins by declaring that there is no objection to be made to the proposition of Böhm-Bawerk that the product increases with the duration of the production.⁶ But he shows us soon afterward that he does not admit here an indefinite increase of the prod-

¹ Positive Theorie, p. 276.

² *Bergehoch*. Ibid., 277.

³ See Einige Fragen, i., *passim*.

⁴ Der Cardinalfehler der Böhm-Bawerkschen Zinstheorie, in the Jahrbuch für Gesetzgebung, Verwaltung und Volkswirtschaft, 1906 (see pp. 953-956).

⁵ Gegenwart und Zukunft in der Wirtschaft, in the Jahrbücher für Nationalökonomie und Statistik, vol. 54 (1890), p. 347.

⁶ The rate of interest, IV., paragraph 3 (p. 58).

ucts. He tells us that a time will come when the product will diminish.¹

Let us see now what reasons Böhm-Bawerk gives us to justify his thesis, what arguments he uses.

Böhm-Bawerk represents somewhere² that each new detour that is decided upon in a production implies recourse to a supplementary "auxiliary force," which would increase the productivity of the labor. The more detours we make, then the more product we shall obtain. But there is nothing convincing in this. Böhm-Bawerk has warned us himself³ that the duration of the productive process does not depend upon the number of detours of production. And, even if the number of detours and the duration of the productive process should correspond, one cannot see why the product should necessarily and indefinitely increase, relatively to the productive expenses, with the multiplication of the auxiliary forces employed.⁴

Again, Böhm-Bawerk represents that, if in society the quantity of capital which each laborer employs could be increased, the production per laborer would be augmented.⁵ But it is not a question of knowing whether, employing more past labor, the present laborer will produce more. It is a question of knowing whether, the present laborer employing more past labor, the product will increase relatively to the unit of labor expended; that is to say, of labor both past and present. Better still, it is a question of knowing whether the product will in-

¹ Ibid., pp. 66-67, 68-69. I may be permitted to quote myself, after the authors above mentioned, and to refer to my *Intérêt du capital*, paragraphs 98, 136-137, and to my *Manuel d'économie*, paragraph 92. In these works, however, I had not got to the point of making a finished study of the question which occupies us here.

² Einige Fragen, pp. 10-11 (1., 2.).

³ Positive Theorie, p. 96.

⁴ In truth, the passage from Böhm-Bawerk which I have just quoted tends less to demonstrate the thesis which is occupying us than to render it probable.

⁵ Einige Fragen, p. 11. In the article, *The Positive Theory of Capital and its Critics*, Böhm-Bawerk considers no longer social production, but a special branch of production.

crease, in the relative manner which I have just indicated, indefinitely. And thus the argument of Böhm-Bawerk loses its force.

What is left, then, to support Böhm-Bawerk's thesis? A certain number of examples with which he illustrates it.¹ There is the example of the man who needs water from a spring distant from his home, and who, instead of going to drink at the spring each time he is thirsty, makes himself a bucket, then arranges a pipe system; there is the example of the man who, after having fished with a line, manufactures a net and constructs a boat; that of the man who wants to lay in a stock of wood, and who, instead of breaking branches with his hands, decides first to manufacture an axe, etc. These few examples, according to Böhm-Bawerk, suffice to establish the universality of the thesis which he sustains. They are typical examples,² each of which represents an indefinite quantity of similar or analogous cases, and thus any one who will consider them attentively is to be persuaded of the truth of Böhm-Bawerk's thesis. Take an article the production of which is already highly capitalistic, and can be decomposed into a large number of stages. There will not be one of these stages in which the capitalistic character of the production cannot be accentuated in a technically advantageous manner by the introduction of some new machine, by the introduction of more elaborate and more durable instruments, etc.³

So reasons Böhm-Bawerk. For my part, I do not see that these examples which he gives us, or suggests to us, prove the universality of his thesis. The universal proposition which might be proved by typical examples is the following: with greater advances, I can increase in-

¹ These examples, scattered through the *Positive Theorie*, have been collected by Böhm-Bawerk in *Einige Fragen*, p. 9 (1., 2.).

² *Einige Fragen*, p. 10.

³ *Ibid.*, pp. 39-40 (1., 8.).

definitely the *absolute* quantity of the product; but this proposition is quite different from that of Böhm-Bawerk. Böhm-Bawerk's proposition is that, with a greater *relative* quantity of capital, one can always obtain a greater number of products for each *unit of expense*. Let us consider a complete productive process. By replacing in one of the stages of this process manual labor by a machine, by replacing certain machines by more elaborate and durable machines, and this in such a way that our productive process employs more capital, I shall always be able to have more products. But shall I always be able to have more products by increasing the relative size of the capital; in other words, by lengthening the duration of the productive process? Nothing so far assures me of it. And, even if it were so, it would still be necessary to prove that, being able to increase the absolute quantity of the product by the lengthening of the productive process, I can at the same time increase the product obtained per unit of expense.

In short, what it is a question of proving is that, if

x land and labor with y capital gives P product,
then

x land and labor with ay capital gives P' product,
or more than p .

Now Böhm-Bawerk's examples show us that, if

x land and labor with y capital gives P product,
then

$a'x$ land and labor with ay capital gives P' product,
 a' in this formula being possibly greater than $\frac{P'}{P}$, and

greater also than a .

Böhm-Bawerk has failed to prove his thesis. What are we to think of it? We must consider it false. Ac-

According to Böhm-Bawerk, the same quantity of expense, if the productive process is lengthened, will give indefinitely increasing products, but products which in truth would increase less and less quickly. In reality, the product per unit of expense will increase at first, to decrease afterward. According to Böhm-Bawerk, 100 units of expense, according as one adopts productive processes of a duration of 1, 2, 3, 4, 5, 6, 7 units of time, will give 200, 280, 350, 400, 440, 475, 500 units of product. In reality, they will give a series something like 200, 280, 350, 240, 160, 80, 40 units of product. All the examples furnished by reality, it seems to me, prove that this is the case.

Here is a forest being planted. Supposing that you wait, to cut the trees, a longer or shorter period of time. The quantity of wood we shall have will keep increasing at first, and remain stationary afterward. Thus, if there were no other expenses than that of planting and that of cutting, we should have for the return of these expenses a curve which would rise at first, with the lengthening of the waiting, and would then change to a horizontal. If we take into consideration that expense which is represented by the value of the use of the land during the time which the wood is allowed to grow, our curve will then have, after an ascending branch, a descending branch.

I intend to cultivate a piece of land. I am going to increase my expenses of cultivation indefinitely and in such a way that the duration of the waiting always increases. Will the product per unit of expense increase indefinitely? Not at all. A time will come even when the supplementary expenses which I shall undertake will no longer increase the product by a quantity equal to their amount. I have a manufacturing enterprise. I increase the capitalistic character of it by introducing new machines, by replacing the buildings and machines

in use by solidier and better constructed buildings and machines. If I continue in this course, I shall arrive after a certain time at expenses the value of which will not be recovered in the product.

In short, if we grant that

x land and labor with y capital gives p product, then, increasing the relative quantity of the capital, it may happen that

x land and labor with ay capital will give p' product, or more than p .

But for a certain relative size of y it will happen that

x land and labor with ay capital will give p'' product, or less than p .

From what I have established regarding the productivity of capital, there is more than one consequence to be drawn. One might draw from it, for example, an argument against the rôle which Böhm-Bawerk attributes to the productivity of capital in the formation of interest, if the views of Böhm-Bawerk on this question did not already in other ways invite criticisms which, to my mind, are decisive.¹ And here is another consequence. If the accentuation of the capitalistic character of production is bound to have the effect, beginning at a certain point, of diminishing the product obtained per unit of advances, then we shall doubtless have to conceive the increase of the relative quantity of capital as bound to tend towards lowering the rate of interest sooner than it would if the scheme of the productivity of capital which Böhm-Bawerk gives us were exact.

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¹ See my *Intérêt du capital*, paragraphs 96-104.